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ABSTRACT

The ways in which data on performance on public examinations could be used as educational performance indicators were studied, focusing on the standard tables developed for the Scottish Office Education Department (SOED). These tables are available for every secondary school in Scotland. Further refinements to follow the planned release of the standard tables in 1991 were also considered. Performance indicators need to be relevant, informative, acceptable, efficient, and feasible. They can then be divided into relative ratings and value-added performance indicators. Relative ratings provide a measure of the performance of departments relative to each other within each school. They indicate how well students in a subject achieve in comparison with their achievement in other subjects in the school. Value-added performance indicators indicate how far students have progressed in a subject in comparison with similar students in other schools. Both methods produce indicators of school performance, and both are calculated from examination reports. Issues arising from looking at performance indicators that must be considered are discussed. It is recommended that the use and development of the standard tables should continue, with value-added performance indicators incorporated into the standard tables for higher grades as soon as possible. The monitoring system set up by the standard tables is timely and cost-efficient. (SLD)

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INTERCHANGE

No 11

Performance Indicators and Examination Results

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Research and Intelligence Unit

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It is axiomatic that every opportunity should be taken to communicate research findings, both inside and outside the Scottish Office Education Department (SOED). Moreover, if research is to have the greatest possible impact on policy and practice, the findings need to be presented in an accessible, interesting and attractive form to policy makers, teachers, lecturers, parents and employers.

Interchange aims to further improve the Research and Intelligence Unit's (RIU) dissemination of the findings of research funded by SOED. We hope you will find that ***Interchange*** is long enough to give the flavour of the complexities, subtleties and limitations of a research study but concise enough to give a good feeling for the findings and in some cases to encourage you to obtain the full report.

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Performance Indicators and Examination Results

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Examination results measure the achievements of individual pupils. But do they also tell us something about the performance of individual schools and departments? This project was commissioned by the Scottish Office Education Department (SOED) in 1990 to look at ways in which data on performance in public examinations could be used as performance indicators. The SOED has worked for several years with the Scottish Examination Board (SEB) on the development of 'standard tables' which show examination entries and results for individual subjects and whole schools. These tables are now produced for every secondary school in Scotland. The researcher was invited to consider the issues surrounding these developments, noting the work already under way in Fife and Strathclyde, and to consider what further developments should follow the planned release of the standard tables in the autumn of 1991. In particular, the project looked at a 'value-added' indicator for performance of students at Higher grade.

Collecting, analysing and reporting performance indicators on schools costs time and money.

Which measures might be the most important, cost-effective and reliable to collect?

Examination results as performance indicators

While examination results are not the only important outcome of schooling they are undoubtedly of concern to pupils, to their parents, to employers and on a wider, national basis. If we accept that examinations are a valid measure of an important part of the work of a school, there are two reasons for using examination results as performance indicators:

- to ensure that all pupils have an equal opportunity to achieve well in examinations regardless of the school attended. This requires quality assurance in every department of every school. Performance indicators must be used to monitor this quality in a way which is fair to pupils and teachers.
- to provide feedback to school departments so that they can monitor their own effectiveness from year to year.

Criteria for performance indicators

Performance indicators need to be evaluated against a number of criteria. The following criteria were developed by the researchers on the basis of literature evidence, experience and logic:

Relevant

Performance indicators should:

1. Be relevant to someone's responsibilities.
2. Refer to something which schools have influence over.

Informative

Performance indicators should:

3. Take account of important factors which can influence the outcomes of schooling.
4. Be fed back promptly to those responsible for the outcomes.

Acceptable

Performance indicators should:

5. Relate to goals on which there is widespread agreement, for example examination results or client satisfaction.
6. Be understandable and accessible to schools.
7. Be explained and supported by staff development work.
8. Be incorruptible.
9. Be able to be checked by schools.
10. Allow improvements in outcomes to show up.
11. Promote good education.

Efficient and feasible

Performance indicators should:

12. Be reasonable in cost to collect, process and feed back to schools.

Performance indicators are not an end in themselves but a means to the end of improving education. The most important criterion is, therefore, that the impact of using the indicator is beneficial (Criterion 11). Whether the effect is beneficial may depend on the type of indicator used. For example, using percentage pass rates in examinations as a performance indicator might encourage teachers to push weaker students off the course, to teach to the borderline group and to ignore the most able who are quite sure to pass. This would be unfair to individual students and might tend to reduce the overall number passing. It is important to choose indicators which improve when each pupil is helped to reach his or her full potential.

Percentage pass rates are often used as performance indicators.

Are percentage pass rates good performance indicators?

Even with a good choice of indicator, the impact of the entire performance indicator system may well depend upon the ethos surrounding the use of indicators. Performance indicators need to be seen not as a threat but as a way of enabling professionals to diagnose strengths and weaknesses and to assure quality in every department.

Applying the criteria

In the main report of this project the criteria were applied to a range of possible performance indicators in schools. *Interchange* will concentrate on a comparison of two types of indictor: 'relative ratings' and 'value-added' performance indicators. These are explained below.

'Relative ratings' performance indicators

Relative ratings indicators provide a measure of the performance of departments relative to each other, within each school. They answer the question:

> *How well did students in my particular subject achieve in comparison with their achievement in other subjects taught in this school?*

Performance indicators should be evaluated against important criteria.

How would you evaluate examination pass rates?

The calculations which produce relative ratings indicators take into account two major influences on the grade that a student achieves: the overall performance of each student taking each subject, and the average national 'difficulty' of each subject. By taking account of these two major factors and then comparing the results of one department with the other departments a relative rating is arrived at for each department in each school.

These indicators can be calculated from one set of examination results. In contrast, the 'value-added' approach requires some prior information about students.

'Value-added' performance indicators

Value-added indicators provide a measure of the progress made by students in the course of an identified period of schooling. They answer the question:

> *How far did students progress in my particular subject, in comparison with similar students in the same subject in other schools?*

Achievement at Higher grade, for example, could be assessed against that at Standard grade. The basis for regarding students as 'similar' is that they had similar grades at Standard grade. This is justifiable since the average grade achieved at Standard grade is always one of the best predictors of achievement in any subject at Higher grade.

One problem with a value-added approach is that performance could in theory appear 'good' because poor results at an earlier level set a low baseline for comparison (and vice versa). Further work on this is required, but this does not seem to present a major problem if the average of a broad set of Standard grade subjects is used as the baseline. One way of looking at value-added indicators at Higher grade without using achievements at Standard grade as the baseline would be to use an aptitude measure.

Comparing relative ratings and value-added performance indicators

Both types of performance indicator provide important information to schools and both take account of the most important factors in grades attained: the student and the subject taken. What then is the relationship between a value-added indicator for a department and a relative rating indicator?

The illustration opposite shows the two performance indicators for a number of subjects in two schools (the comparisons focus on value-added indicators at Higher grade in secondary 5, comparing performance with Standard grade in secondary 4). Bars to the right of the middle represent better than expected performance and bars to the left represent worse than expected performance. It can be seen that the indicators gave similar messages to some extent. (In statistical terms there are high correlations, subject by subject, between the two indicators, averaging about 0.7.) There is no necessity for the two indicators to give the same message because they answer different questions. The fact that the two ratings have a similar pattern shows that, in general, departments which are above average in value-added, tend to be the departments which are doing well relative to other departments in their own school.

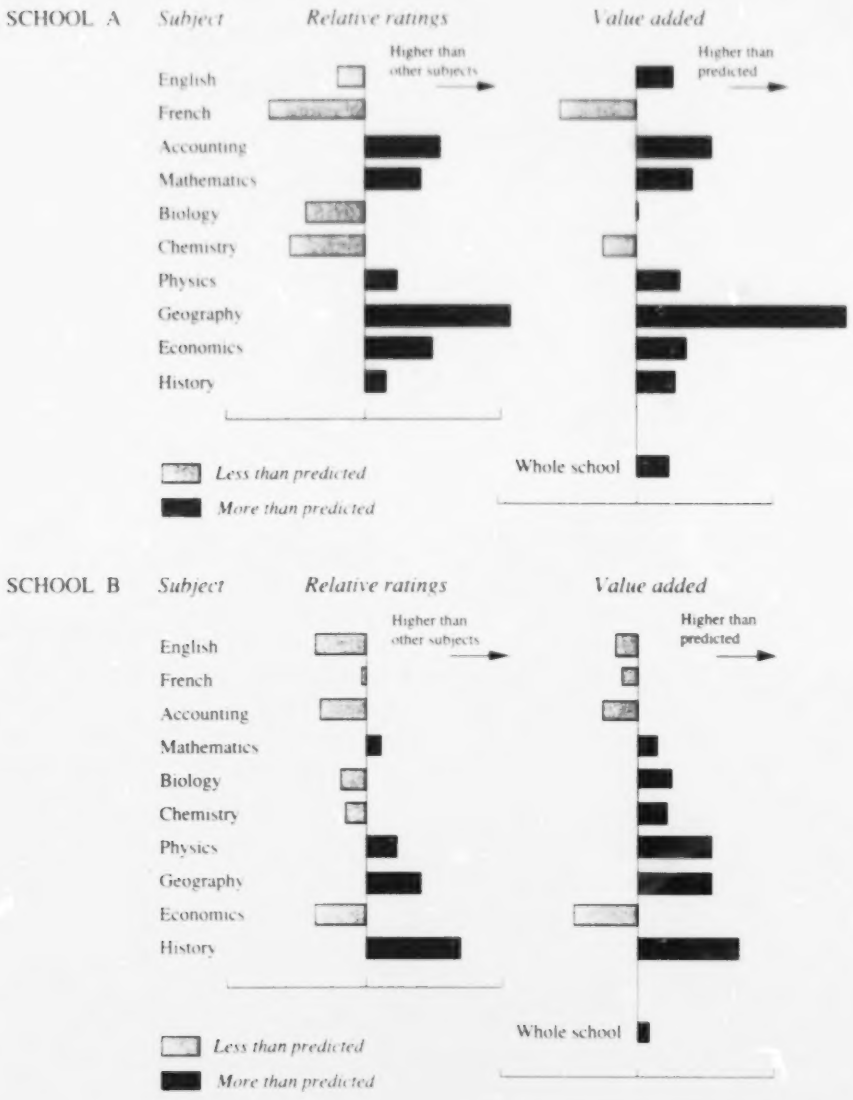
Relative ratings and value-added indicators each provide a measure of the effectiveness of school departments.

How would you compare each of these against the criteria shown earlier?

Because relative ratings show a department's results relative to those in other departments in the school, the relative ratings will tend to 'cancel out': there will tend to be as many positive as negative results in every school. You can see this in School A in which there are roughly as many bars to the left as to the right. (As in the standard tables, there are bars omitted owing to small numbers in some subjects.) The value-added results, however, could be all positive or all negative, although it seems that in practice this rarely happens. Each year most schools obtain results in line with expectations but with some departments doing particularly well or particularly poorly. Exactly how to interpret these indicators will require a good deal of experience. Each school can check the data against its own experience.

In School B it can be seen that the science and mathematics departments all obtained positive results in the value-added analyses: they were achieving better results than departments elsewhere that had students with similar grades in secondary 4. In the relative ratings data however, two of these departments, biology and chemistry, had negative values. This might be because they shared many students with physics and mathematics departments and those shared students did even better in physics and mathematics, once subject difficulties had been taken into account, than they did in biology and chemistry. It can happen in relative ratings that, where subjects have many students in common, good results in one subject will be balanced by negative ratings in the other subjects.

Comparison of relative ratings and value-added performance indicators for two different schools



In summary, the relative ratings indicator compares departments within a school with each other. The value-added indicators for Higher grade compares a department with students in other schools who had similar grades in secondary 4. The performance of the students in their other Higher grade subjects does not enter into the computations for value-added. Both methods take account of the different difficulties of examinations in different subjects. Both methods produce an indicator at the level of the school department

— the level at which differences in effectiveness are likely to be greatest. Both methods are calculated on the examination results as they become available each year. Thus changes in the difficulties of examinations from year to year are taken into account, since a new set of data is used each year.

Issues arising

Certain issues arose from looking at the various performance indicators:

The SOED standard tables

These tables of examination results for individual schools will be very valuable. They will provide relative ratings and national comparison factors for examination subjects at Standard grade and Higher grade plus, possibly, a value-added measure for Higher grade. These indicators meet the more important criteria and together will form a basis for self-evaluation by schools, for external evaluation and quality assurance.

Teacher-given assessments

Assessing performance requires the use of complex judgements.

How do you rate teacher-given assessments on the criteria 5, 8, 9, 10 and 11 shown earlier?

Can grades given internally by teachers be used in performance monitoring; for example could they provide a valid and reliable baseline for the value-added approach prior to secondary 4? The published criteria for marking criterion-referenced assessments rely on large amounts of teacher judgements which are not easy to standardise. The author's view is that criterion-referencing may work well in preparing students for clearly defined tasks, but it can encompass only a small part of the rich variety of learning which schools provide.

Anonymity of examination scripts

Names of pupils and their schools often contain information such as the sex, socio-economic status, ethnicity and religious affiliation of the pupils. We do not know the extent to which markers are biased by the information but this would seem to be an area where quality assurance has to be embedded in defensible procedures: one possibility is that names could be removed from scripts prior to their being sent out to markers.

Vocational skills

The topic of vocational skills is very much to the fore at this time and performance indicators will be needed if the status of vocational qualifications is to be raised. In the academic area, external assessment in examinations has provided widely acceptable certification procedures, in which standards can be closely monitored. The existence of uniform standards of external certification would allow performance indicators to be created for vocational and practical skills.

Examples of monitoring systems

Having considered the criteria which might be used to evaluate performance indicators and examined how two of these work out in practice, the researchers looked briefly at some features of existing performance indicators systems.

Some of these systems are designed to monitor the system at higher levels, to provide 'scanning indicators' at a national level: for example, the Scottish Young People's Survey (SYPS) and the Youth Cohort Study (England and Wales), which track young people as they leave school and aim to look at trends and policy issues. There is also the census type data of the School Leaver Survey from the SOED Statistics Branch

Some systems aim to feed back information into schools, for example the A-Level Information System (ALIS) in Newcastle upon Tyne. A number of education authorities have undertaken extensive work on performance indicators: Fife's work (with Edinburgh University) is notable for having a measure of ability and Strathclyde's for the user friendly computer-based feedback.

Recommendations

The use and development of the standard tables in Scotland should continue. Notable features of the tables are that:

- examination data is used both raw and adjusted for intakes;
- data is presented for individual examination subject as well as for whole schools;
- data is presented in three-year sets to allow trends to show;
- analyses are made available to every school in Scotland;
- the indicator system is linked to the work of the Scottish Examinations Board (SEB).

Value-added performance indicators should be incorporated into the standard tables for Higher grade as soon as possible. The SEB is conducting pilot work on value-added indicators for Higher grade, in connection with the project reported here.

The ethos of a performance indicator system should be developed as effectively as possible. The following points may help:

- Performance indicators should be seen as measuring the extent to which agreed goals are being achieved and agreement should develop as the system develops.
- The atmosphere should be one of information and collaborative investigation, not surveillance and judgement.
- The indicators should be broken down into the units of management within schools: generally school departments or their equivalents.
- The aim should be for quality assurance in every department, not competition between institutions.
- School departments/faculties should receive and understand all the performance indicator data.

Conclusions

Through the standard tables the SOED has set up a monitoring system which can provide information to almost every department in every school in Scotland. This yearly database will provide a framework for the work of HM Inspectorate and education authority inspectors and advisers. The creation of the standard tables is impressive and by linking the system to the work of the SEB the SOED has created a cost-efficient and timely system.

Inevitably, this performance indicator system rests on the adequacy of the examinations provided by the SEB. However, given the broad professional involvement in the work of the SEB, its carefully established procedures and responsiveness to educational developments, there are reasons to be confident about the use of examination results as a way of monitoring school performance.

The development of the standard tables, and their coming extension to provide value-added indicators, undoubtedly puts Scotland in the forefront of developments taking place around the world in the monitoring of educational outcomes. While some people will deplore the over-simplification provided by numerical indicators, others will welcome data which cuts through the confusion of guesswork, rumour and reputation. The impact on the educational system will be observed with interest.

Full report of the project

Evaluation of School Performance in Public Examinations. C T Fitz-Gibbon. This can be obtained from the author (price £8.00) at: The Curriculum, Evaluation and Management Centre, The School of Education, University of Newcastle Upon Tyne, NE1 7RU.

Further reading

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The views expressed in this paper are those of the authors and do not necessarily reflect those of the Scottish Office Education Department who funded the study.

Notes

Costs and benefits of different performance indicators

Percentage pass rates as performance indicators

Criteria for evaluating performance indicators

Relative ratings versus value-added performance indicators

Examination versus teacher-given assessments

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Further Information

If you have views on ***Interchange*** and/or wish to find out more about RIU's research programme contact the Research and Intelligence Unit (RIU), Scottish Office Education Department, Room 4/48, New St Andrew's House, Edinburgh EH1 3SY.

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